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Perceptual deficits in child development have been found to be very common in the underachiever. Such deficits can be identified and treated with training in coordination skills such as large motor, hand-eye, and auditory-speech. This paper reports an innovative training project in three New York state elementary schools. Subjects were selected from grades one through three by low scores on seven tests of various coordination skills and achievement. Pupils met with the teacher in pairs for two, half-hour periods a week during a school year. Training included large-motor skills, five motor and hand-eye coordinations, auditory perception, and critical thinking skills. At the end of the year, the tests were re-administered, and gains were registered in all areas, well in excess of expected gains. From 50-75% of all pupils progressed beyond normal growth rate. Retesting a year later showed no regression of skills. Improvement in academic work as well as increased attention span was reported by teachers for about 50% of pupils in training. (BP)

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A MULTI-DISTRICT USE OF VISUAL TRAINING

AS AN INSTRUCTIONAL APPROACH IN ELEMENTARY EDUCATION

Principal Investigator

Mrs. Alice M. Rohr
School Psychologist,
Draper, Duanesburg and Berne-Knox Schools

Implementing Agency

Board of Cooperative Educational Services of
Albany, Schoharie and Schenectady
Draper, Duanesburg and Berne-Knox Schools

July, 1968

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Implementing Agency

Board of Cooperative Educational Services of
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Dr. Robert C. Rohr was chief morale builder and statistician of the project. He gave many hours as statistical advisor and computer both years.

Mr. Ronald Conners and Mrs. Margaret Morey, of the Berne-Knox School showed active interest in the project making personal trips to Albany and Connecticutt to become better informed in perceptual training. As a result Mr. Conners offered several concrete suggestions for our program. Mrs. Morey aided in teaching auditory perception in the elementary school. She has also reported a decrease in visual problems in first grade classes whose pupils had perceptual training in kindergarten.

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Introduction

A great number of elementary pupils who have alert, eager minds also have major problems with academic achievement. Children who apply themselves well, score average or above on mental ability scales but who cannot write on a straight line, cannot consistently distinguish between p, b and d, and are generally awkward, will profit by individualized attention.

When examined, these children frequently show good verbal reasoning ability but very poor eye-hand coordination, poorly developed large muscle coordination and imbalance in binocular functioning, particularly at reading distance. They often perform poorly in auditory perception as well. That is, they pass audiometer tests but fail to identify common sounds, have difficulty reproducing rhythm patterns and hearing pitch variations. They are also poor observers of their surroundings. Such children form at least fifty per cent of psychological referrals within the average school system.

When such handicaps are discovered and defined, the classroom teacher alone has little opportunity to begin a program which will enhance only these skills. However, with the help of another staff member, well trained in visual-perceptual development, the teacher can incorporate developmental exercises within her classroom for those pupils who will benefit from it. Therefore, two years ago, a visual training program was inaugurated for three school districts. The nature of the program was based on personal experimentation as well as published literature and professional consultation in the field. The program can easily be adapted to other schools or modified for use in the classroom.

The major goal of visual training in the elementary schools is to increase the pupils' facility to perceive space relations and to manipulate objects effectively within spatial boundaries. Experimental evidence indicates that as pupils relate objects in space meaningfully, academic success is also enhanced.

Several centers throughout the country have conducted such research and have found, in many pilot settings, that perceptual training aids the pupil's general body movement and handling of objects about him. Some of these centers are the Gazelle Institute in Connecticutt, directed by Dr. John Streff, the reading laboratory and clinic in Gainsville, Florida, headed by Dr. George D. Spache[5], the Winter Haven project in Florida with Dr. Delacatto, research at Purdue University directed by Dr. Newell C. Kephart[3], R. G. Lowder's doctoral thesis at Purdue[4], Dr. Marrianne Frostig in California, as well as the work of optometrists such as Dr. G. N. Getman[1], Dr. D. B. Harmon and Dr. R. A. Kraskin.

While the intricacies of neurological mechanics is still open to further explanation, the common findings at these centers is that a youngster manifesting poor coordinations and perceptions is handicapped in learning. When skills of coordination and perception are mastered, there is carry over and improvement in academic performance, particularly in reading and writing. It appears that some youngsters do not develop these skills automatically but when their attention is drawn to the skills, they do have the capacity to develop them.

Pupil Selection Procedures

An innovative project is distinguished from an experimental one in that it is applying new methodology which has already been studied experimentally. In an experimental project it is necessary to have at least two groups: an experimental group, given "new treatment" and a control group, given "usual procedures". Such research has been done at Purdue, University of Florida, as well as locally in 1965-66 by psychologists Mrs. Alice M. Rohr and Mr. H. Mason at Draper, Berne-Knox and Schoharie Schools. This innovative project, therefore, is not of experimental design but of innovative. The data gathered and studied are "before and after" treatment results. The results are compared statistically by paired variates.

In the two years that the project has functioned, it has been found that pupils from six to eight years of age profit most by the type of training offered. During the first year of the project all of the children in grades one through three in three school districts were screened. This was about 800 children. From these, 180 pupils were selected for further testing and 120 received training.

In the second year of the project, about 200 first graders were screened in the classroom and 72 selected for further testing. This year, from the total population, 54 received individual training. In terms of percentages from 25 to 30 per cent of the total population in the classrooms showed some form of perceptual deficits on the gross screenings and ten to fifteen per cent of the total population were considered poor enough to be included in the training. About two-thirds of these were first graders. About an equal number of boys and girls were involved.

Classroom gross screening included the administration of the Goodenough Draw-A-Man test and the copying of two geometric shapes. The shapes used were a horizontal diamond and divided rectangle. These two were selected on the basis of Lowder's findings[4]. Lowder's work with primary pupils showed a high coefficient of correlation between reading problems and poor reproduction of these two shapes.

The Draw-A-Man test was selected to depict pupil's idea of body image and to attain a mental age score in an area heavily influenced by visual perception.

After initial screening the work of those who scored in the "low" range, as described by Lowder on either geometric shape, or whose Goodenough mental age was fifteen months below chronological age were discussed with the classroom teacher. Of these, pupils who were described by the teacher as having short attention span, reading or writing difficulties but who demonstrated good verbal reasoning in class were considered for training.

The further, finer testing included administration of a partial Bender, WISC similarities and block design, the Wide Range reading achievement test, two near-point Keystone telebinocular cards, kinaesthetic awareness and occular control.

The Bender cards A and 4 were used because the psychologist in charge has observed these to be particularly sensitive to perceptual integration and distortion.

Wechsler's similarities and block design were used with particular concern for a deviation of three or more points between the two scaled scores. Similarities reflects abstract conceptualization. Block design reflects an aspect of visual synthesis. It was theorized that average conceptualization in the presence of poor visual synthesis was further indication of a lag in visual-perceptual development.

Keystone telebinocular cards 10 and 11 were used to measure the binocular functioning of the eyes at reading distance. Any score in the "doubtful" range on the Keystone chart was considered significant. The school nurses' results on visual and auditory screening were included to indicate the far point visual acuity and hearing acuity of the pupils. These acuities were generally good.

The wide range reading achievement level was used as an objective measure of "before and after training" reading performance.

Children were considered candidates for visual training if at least four of the following seven criteria existed.

1. The Goodenough Mental age was fifteen months or more below chronological age.

2. Total Bender score (Kopitz scoring) on cards A and 4 of two or more.

3. Rated "low" by Lowder scoring on either the horizontal diamond or divided rectangle.

4. Had a WISC block design or object assembly scaled score of three or more points lower than similarities.

5. Had a reading level one year or more below grade level.

6. Scored in the "doubtful" range on Keystone visual survey on either card 10 or 11.

7. Teacher reported poor attention span.

In the first year the psychologist and special teacher both administered the screening tests. The psychologist scored and interpreted all results. In the second year the teacher took more of the responsibility of administration and scoring just consulting with the psychologist. Each year conversations were held with art, physical education and nurse teachers to gain a more complete picture of the children to be trained.

After the children to be instructed were identified they met in pairs with the special teacher for two half-hour periods per week. In the first year, pupils were trained for ten weeks. The teacher then proceeded to another school district for another ten weeks with new pupils. Each of the

three school districts, Draper, Duanesburg and Berne-Knox, had forty pupils in the program. One hundred twenty pupils received individual training the first year.

In the second year effort was made to adapt the program in the classroom. It was felt that the goal of the pfoject would be to develop a teacher's manual which could be directly applicable to the classroom.

Berne-Knox was the elementary school which expanded perceptual training to the classroom this year. Mr. Conners, principal at Berne-Knox, equipped his kindergartens and first grades with many perceptual training devices. A balance board and walking beam were placed in each kindergarten room. Materials such as two levels of Frostig's Pictures and Patterns were provided as well as seven sets of each of the following: parquetry blocks, play tiles, colored blocks and Winter Haven perceptual kits. Several records for auditory perception were purchased and presented to whole classes by Mrs. Morey, the school nurse. A trampoline and forty-eight balls were added to the gym equipment which all pupils use. The adapted perceptual program, therefore, reached all elementary pupils in gym and all kindergartners in class. In first grade ten per cent of the children were instructed with perceptual materials while the other ninety per cent had access to it as play materials. Books on perception were added to the professional library in order to further teacher knowledge. The teachers determined which pupils would receive the training on the basis of classroom performance. At Berne-Knox, one hundred ten pupils received perceptual instruction in the classroom. The approximate cost of the equipment was $775.00. Continued use of this equipment is planned for next year.

During this second year at Draper a class for more markedly impaired children were given training once a week for one semester. A kindergarten class of twenty was also given training once a week for one semester. A total of fifty-four pupils in Draper and Duanesburg were given individual training similar to that of the first year. Therefore, a total of two hundred pupils have received some form of perceptual training this year.

Educational Activities

The following five pages lists the instructional methods used in training the pairs of children selected. Most of these methods are explained in detail in books by Kephart[2], Getman[1] and Spache[4]. While the list here is divided into areas of muscular-coordination, eye-hand coordination, space relations, etc., parts of different areas are presented to the children during a single training session. It is not expected that a child master the list as it appears. Since natural development occurs in more than one area at a time training also follows these natural developmental lines. As the young child learns to walk he is also experimenting with objects, exploring space and listening to sounds. He does not become proficient in one isolated area, such as toe dancing, then begin to learn words. These various phases develop and become increasingly complex as an interrelated whole. Learning moves from the simple to the complex but not in a linear fashion. Therefore, in our training the skills listed are presented in order of increasing complexity but in two or three areas at a time. For example, pupils are started with large-motor activities, such as jumping jacks and walking beam. At the same time they work with identifying

basic geometric shapes. Then they move to eye-hand coordination activities, learn template work and vertical reproduction of shapes on the chalkboard. For many to transpose the same shape from vertical chalkboard to horizontal paper is difficult. Once mastered, children then combine shapes to form objects and label objects with appropriate words. These steps towards abstraction, taken at the pace each child is able to move, were found important in building and strengthening the child's tools for reading.

This year more attention has been given to listening skills and auditory perception. The most complicated of these is listening to a tape while the teacher reads a story simultaneously. The child is instructed to attend to just one and answer questions on one. The aim here is to help the child be selective in listening while disregarding distraction. The tape generally contains verbal phrases and intermittent noise.

Another addition to the training in the second year is the area of critical thinking. Here the child is presented with differing objects and asked to find the similarities. Objects may be a set of shapes such as square, rhombus and triangle or set of pictures related to cold, transportation, etc. He is also presented with similar objects and asked to observe their differences. These may involve pictures of several cats, birds, cars, etc. Worksheets are used also with pictures to be categorized into abstract qualities of hot-cold, fast-slow, etc. The purpose of critical thinking skills is to sharpen the child's awareness of things about him and establish a pattern of independent reasoning based on his own concrete observations. This type of thinking is valuable in gaining meaning from reading material he will meet later in the classroom.

Instructional Methods

1. Large Motor Coordination

   A. Walk 2 x 4 beam forward, backward and sideways (cross feet over).

   B. Jumping Jack - regular and reverse - do also in rhythm with music or metronome.

   C. Posture - back flat on wall - then walk away.

   D. Pass ball through legs. Forms a figure eight pattern, beginning on outer side of one leg move ball towards back and through legs.

   E. Pass ball through hands. On table-top with two people.

   F. Knee beat rhythms - tap knees with hands in varying patterns as directed.

   G. Simultaneous circular motion at chalkboard.

2. Binocular Coordination

   A. Follow moving target in circular patterns and figure eights. Monocular - binocular - on balance board.

B. Plastic target
Look at plastic target, then look through plastic target to wall. Focus attention on space between plastic and wall.

C. Saccadic fixation - move eye from point to poirt in rhythm - on command - on balance board.

D. Body rock monocular
Place numbers on wall - measure distance at point where numbers begin to blur with both eyes - cover one eye rock toward and away from numbers - remeasure point at which numbers blur.

E. Closed eye movement
Snap fingers, have pupil look towards the snap and be aware of feeling eye movement on lids. Watch for movement.

3. Eye - Large Muscle Coordination

A. Ball on string suspended from ceiling. Control ball swinging back and forth from ceiling - two hands pass ball back and forth - when smooth tap foot with hand contact - later alternate foot and hands while controlling ball - can be reinforced by counting aloud. When all three are smooth, add distracting conversation to task. Do same pushing ball in a circular motion.

B. Ball on pole
Control straight swings and round circular swings.
Control stopping by reverse action.

C. Touch one point on chalkboard with hand and floor with foot. Reach with hand and foot simultaneously to fixed points on chalkboard and floor, then step back. Teacher can count for child to establish fixed rhythm, then have child count also--1-2, 1-2. Can also use rhythmical music background. When smooth introduce distracting conversation. Use alternate hand foot combinations also.

D. Grasp from balance board
Have pupils stand on balance board and reach for passing objects, bounce ball on floor, throw and catch bean bag.

4. Eye - Hand Coordination - Do all on balance board when possible.

A. Ring piercing - Teacher has wire loop one half inch in diameter. Pupil has pencil, or pointer in hand at side. Teacher moves ring to various positions. Pupil pierces ring with pointer. Pupil uses one eye and one hand in all combinations. That is, left eye, left hand; left eye, right hand, etc.

B. Pencil on string - tie pencil to string. Hold pencil in right hand, and string to nose with left hand, cover one eye, move pencil in circles and figure eights watching pencil at all times. Note smoothness of eye movement. Have pupil report appearance of string - whether there are 2 or 1, or if they blink off and on - blinking indicates stress on eyes. Alternate left hand, with left eye, etc., when smooth monocularly, use both eyes.

C. Thumb rotation - similar to 4B except just hold thumb out at arms length and follow circular movements with each eye.

D. Pie tin rotation - hold pie tin in one hand - rotate marble along inner edge of rim in both directions watching marble at all times. Use both round and rectangular pie tins. Exchange hands on both and hold rectangular tin at corners as well as sides.

E. Scrambled letter target - place scrambled letters on a wall, give pupil a wire ring to ring the letters. He begins by holding ring behind his head, sights letter, moves with one straight swift motion to letter while keeping eye on letter. Letters may be called or pupil may be given a word to "ring out".

F. Match light beams
Instructor and pupil each have a flashligh. Instructor moves light slowly in various patterns on wall. Pupil follows simultaneously matching the pattern.

5. Space Relations

A. Have pupil estimate the apparent size of an object at a distance. Give pupil an unmarked measuring tape. Ask him to estimate the height, width, and depth of various objects by tieing a knot in the tape. Distance from knot to end of tape represents size of object. Record the percentage of over and under estimation.

B. Have pupil estimate distance from himself to wall, or distant object, by estimating the number of paces needed to reach the object. Record the percentage of over or under estimation.

C. Blindfold
Have pupil look at room to familiarize himself with existing relationships within it. Blindfold child and instruct him to proceed to particular objects in room.
Observe accuracy in directionality, touching objects, and awareness of space between himself and objects as well as between objects.

6. Auditory - Perception

A. Increase auditory span
Dictate span of numbers or mono syllables, have pupil repeat them. This should be done over a period of weeks until child increases memory span to six syllables for first grade and eight for third grade.

B. Rhythm - Patterning
Tap desk with hands and floor with feet while counting.

C. Buzzer matching
Teacher sounds groups of dots and dashes with buzzer. Pupil imitates pattern with chalk on chalkboard or with pencil on paper.

D. Saccadic movement with conversation
Have pupil move eyes across room focusing on two different targets while discussing any topic.

E. Identify common noises blindfolded.

F. Imitate sounds.

G. Listen to two stories simultaneously and be directed to attend to one.

H. Reproduce note sequence on xylophone.

7. Form Sequencing

A. Template tracing
Use template on chalkboard or paper to instruct in making basic geometric shapes, such as square, triangle, diamond, etc.

B. Form sequence
Place a sequential pattern of basic geometric shapes on chalkboard in both horizontal and vertical directions. Have pupil copy these using template or free hand on paper; or by sequencing paper shape forms which are already cut.

C. Bead sequence
String beads of varying shapes and colors. Have pupil match from memory.

D. Stick figure sequence
Opportunity to make more complex patterns by varying size and shape of forms from toothpicks, popsicle sticks, etc.

E. Block design
Relate parts to whole in copying patterning of colored blocks also instruct to reproduce in reverse, upsidedown or from memory.

F. Kinaesthetic perception of form
Give pupil a cardboard square behind his back and ask him to draw shape without looking at shape given. Give pupil sequence of circles, squares and diamonds one at a time behind his back. Ask him to reproduce the sequence from memory.

G. Give pupil three to six cans of varying size. Blindfold him and ask him to place them in order of increasing size. Can be done with one size of increasing weight also.

8. Form Development and Labeling

A. Form to concrete objects.
Give pupils templates to trace forms allowing him to combine them to make real, familiar objects.

B. Labeling
As pupil relates forms to objects, discuss initial sound of object

and represent it by initial letter of word. Expand to writing whole word.

C. Word matching
Cards with picture and word. From a group of words have pupil select word which describes picture.

9. Critical Thinking

A. Observation of similarities in different objects.

B. Observation of differences in similar objects.

C. Categorizing objects according to abstract qualities.

D. Synthesis

In order to know the relative value of each of these activities in the program, the following frequency distribution was made of their use in training.

Table 1

Frequency Distribution of Instructional Activities

Instructional Activity	Number of Times Presented		
	Draper	Duanesburg	Total
1. Large Motor Coordination			
A. Walking Beam	127	218	345
B. Jumping Jack	211	295	506
C. Posture	28	31	59
D. Ball pass through legs	99	155	254
E. Ball pass through hands	66	104	170
F. Knee Beat Rhythms	47	57	104
G. Circular Chalk Motion	93	134	227
2. Binocular Coordination			
A. Moving Target	100	129	229
B. Transparent Target	27	36	63
C. Saccadic Fixation	95	93	188
D. Body Rock Monocular	52	104	156
E. Closed Eye Movement	63	61	124
3. Eye-Large Muscle Coordination			
A. Ball on String	119	135	254
B. Ball on Pole	79	106	185
C. Rhythmic Touch to Chalkboard	136	187	323
D. Grasp From Balance Board	161	209	370

Table 1 continued

	Draper	Duanesburg	Total
4. Eye-Hand Coordination			
A. Ring Piercing	47	56	103
B. Pencil on String	0	0	0
C. Thumb Rotation	62	78	140
D. Pie Tin Rotation	61	78	139
E. Scrambled Letter Target	44	57	101
5. Space Relations			
A. Size Estimate	41	41	82
B. Distance Estimates	59	66	125
C. Blindfold Perception	22	31	53
6. Auditory-Visual-Motor Coordination			
A. Auditory Span	92	114	206
B. Rhythm Patterning	31	46	77
C. Buzzer Matching	14	37	51
D. Saccadic Movement	38	41	79
E. Identify Common Noises	9	40	49
F. Imitate Sounds	9	40	49
G. Simultaneous Stories	9	0	9
7. Form Sequencing			
A. Template Tracing	89	92	181
B. Form Sequence	284	277	561
C. Bead Sequence	158	165	323
D. Stick Figure Sequence	37	55	92
E. Block Design	118	136	254
F. Kinaesthetic Perception	43	68	111
8. Form Development and Labeling			
A. Form to Objects	58	55	113
B. Labeling	50	59	109
C. Word Matching	57	52	109
9. Critical Thinking			
A. Similarities	24	80	104
B. Differences	31	74	105
C. Abstract Reasoning	200	80	280
D. Synthesis	100	140	240

After each child completed the training program, he was retested with the same tests he was given in order to qualify for training. The differences in his scores were used as an indication of progress. The differences between test and re-test scores were studied to determine whether or not improvements were significant, i.e., whether or not the progress during the testing period was greater than normal expected growth. In order to determine this statistically, student's t-test was applied to paired variates.

Results

The tables in the appendix give detailed figures on data presented here. Table 6 shows the number and grade levels of boys and girls involved in the individual training for both years. Charts on page A2 and following show specific scores for the two years for each pupil. Scores are listed for both before and after training. A difference column indicates the change measured. The pupil number column represents the number assigned each pupil. In cases where the number appears both years the pupil was retained in the program both years. Where "1/2" appears before the pupil number, he was in the program a half year.

In this innovative project, experimental design of experimental and control groups is innappropriate. Therefore, in order to determine the effectiveness of training, a study of paired variates was made. This means that the differences in test scores obtained before training and after training were studied with respect to the differences which could be expected in normal growth for each pupil. The two scores on each pupil are related because they involve the same individual. The two scores are not independent; therefore, the statistical technique of paired variates was selected. Normal growth for both reading level change as well as the Goodenough mental age was the length of time pupils were in training. In the first year this was two and a half months. In the second year this was either four months or nine months, depending on whether the pupil was in training all year or half a year.

Normal growth on WISC sub-tests were equated to his scaled score charts. When looking at these charts in Wechsler's manual[6] the expected change in similarities and block design for children six to eight years old is about one point in nine months. Experiential change with Bender and geometric shapes indicated expected growth in these areas to be zero for ten weeks, .5 for four months, and one for nine months. Lowder's rating of geometric shapes as high, average, low were given the respective numerical values of 1, 2 and 3 in order to correlate with Kopitz scoring of Bender configurations. Kopitz scoring[3] assigns point values for errors in copying the shapes.

Table 2 shows the expected change, mean difference, standard deviation and Student's t factor and level of significance for the first year's pupils. Table 3 shows the same thing for the second year's pupils who were in training four months. Similarly, Table 4 gives the information for second year's pupils in training for nine months.

The standard deviations were found by the following formula:

$$\sigma = \sqrt{\frac{1}{N-1}\left[\sum x^2 - \frac{(\sum x)^2}{N}\right]}$$

Student's t factor was found by using: $t = \frac{\bar{X} - \mu}{\sigma/\sqrt{N}}$ where μ represents expected change and the other symbols are the usual representations. The level of significance was found by using Student's t tables.

Table 2. Significance of Mean Differences

10 WKs. Training

	MA Mos.	Read. Mos.	Bender	Shapes point diff.	WISC Simil	WISC BL De
Expected Change	3.0	2.0	0	0	0	0
Mean Difference	5.5	3.1	0.71	1.4	2.2	2.6
Growth beyond exp. in months	2.5	1.1	5.	9.	12.	12.
Standard deviation of means of differ.	8.1	3.1	1.4	1.2	2.7	2.4
t factor	3.4	3.8	5.6	13.0	8.9	12.0
Level of significance	>99.9%	>99.9%	>99.9%	>99.9%	>99.9%	>99.9%

Table 3. Significance of Mean Differences

4 Mos. Training

Expected Change	4.	4.	.5	.5	0	0
Mean Difference	8.6	7.8	1.4	1.5	1.3	2.8
Growth beyond exp. in months	4.6	3.8	9.	9.	6.	12.
Standard deviation of means of differ.	9.9	6.6	1.4	1.3	2.6	3.1
t factor	3.06	2.9	3.2	3.8	2.5	4.5
Level of significance	>99%	>99%	>99%	>99%	>98%	>99%

Table 4. Significance of Mean Differences

9 Mos. Training

Expected Change	9.	9.	1.	1.	1.	1.
Mean Difference	17.0	9.4	1.7	1.9	2.0	2.5
Growth beyond exp. in months	8.0	.4	6.	8.	12.	12.
Standard deviation of means of differ.	8.1	5.1	1.6	1.2	2.6	3.7
t factor	5.3	.43	2.4	4.1	2.0	3.7
Level of significance	>99%	>30%	>95%	>99%	>95%	>99%

All three tables show measured growth during the training period to be above the expected growth. The growth beyond the expected occurs in all six areas measured. The average excess growth for all pupils trained was 5 months on the Goodenough Draw-A-Man test, 1.8 months for reading improvement, 6.7 months for Bender gestalt, 8.6 for geometric shapes, 10 months for WISC similarities and 12 months for WISC block design. These averages are based on 172 paired scores.

When subjected to Student's t test for the level of significance of this growth all, except one, are above ninety-five per cent. That is, there is at least a ninety-five per cent probability that these results did not occur by chance. This means that the standard deviations are low and the validity of test data high.

When considering the relative value of a longer period of training time, the tables show greater improvement in the Draw-A-Man test as training time increases. However, no other time-score relationship appears evident. In studying individual score differences to explain this it appears that those pupils who were regarded by the teacher to need further training showed little or no progress in year-end testing. Another major factor influencing the statistics is the individual responsiveness of pupils to the program. Those with severe handicaps, such as recent eye surgery, or disinterested parents, progress much more slowly than the alert child whose parents build equipment and help the child practice at home. Those whose measured growth is the highest are often the ones who worked hardest outside of class. The statistics, therefore, serve in a general way to realize that significant progress is being made.

Another way to observe this is through [illegible] grouping. Table 5 shows the numbers of children who progressed beyond the expected growth rate, those who progressed as normally expected and those who showed no progress. This table indicates that from fifty to seventy-five per cent of the pupils progressed beyond the expected growth rates. Again those who fell in the no progress group were those giving evidence of needing further training.

Table 5

Modal Groups

Numbers Represent Children

	MA	Read	Bender	Geo.Sh.	WISC Sim.	WISC BL De
10 wk training						
Growth beyond expected	60	61	67	91	80	84
Normal Growth	38	40	33	21	27	25
No Progress	20	17	18	6	11	9
4 mos. training						
Growth beyond expected	12	14	15	14	15	18
Normal Growth	5	9	8	11	3	4
No Progress	8	2	2	0	7	3
9 mos. training						
Growth beyond expected	23	17	16	20	15	12
Normal Growth	5	12	11	9	9	11
No Progress	1	0	2	0	5	6
Totals	172	172	172	172	172	172

In March, four test items were re-administered to all pupils who had been in training last year but who were not in training this year. This was about 100 pupils. The purpose of the retesting was to determine the lasting effect of the ten-week training program. WISC similarities and block design were readministered as well as copying geometric shapes and reading. The results of this showed no regressions of test scores from the preceding year indicating a lasting effect of training. However, pupil progress as reflected in the test scores were minimal. In all cases, progress without training in the nine month time span was about five to six months. It is hoped that with prolonged training this year pupils will not only retain learned skills, but also progress at a normally expected rate.

Comments from both teachers and parents have been encouraging. Improvement in academic work as well as increased attention span was reported by teachers for about eighty per cent of the pupils in training. Objective scoring as well as staff comments suggests that perceptual training is an asset to the progress of many elementary pupils.

Summary

Perceptual deficits in child development have been found to be very common in the underachiever. Experimentation at many universities in our country, such as Purdue and Miami, has shown that perceptual deficits can be identified and treated. Treatment is in the form of training in various skills of coordination such as large motor, eye-hand and auditory-speech.

In this innovative project such training has been offered as a new approach to enhancing perceptual development of the underachiever who scores low in perceptual tests but average or above in general ability. This project is not experimental--it is innovative in that it applies knowledge gained in previous experimentation. Therefore, there is just one group of children, the "treated".

The children to be trained in the program were selected by a two-step screening procedure. First, all pupils in grades 1 - 3 were given the Goodenough Draw-A-Man, two Bender cards and two geometric shapes to draw. The lowest ten per cent of these pupils were tested further by Keystone telebinocular, WISC similarities and block design, Wide Range and Reading achievement test. If the pupil scored poorly on four of these seven tests and teacher conference confirmed coordination difficulties, the child was enrolled in the training program.

The uniqueness of the training is the individual attention given each child. Pupils met with the teacher in pairs for two half-hour periods a week. In this way, training techniques were constantly matched with individual progress.

The training included large-motor activities, such as jumping jacks and balance board skills. Fine motor and eye-hand coordinations were improved by controlled moving of a ball on a string, by use of templates and other skill games. Training of auditory perception by identifying hidden noises or repeating scrambled words was part of the program. Critical thinking skills were enhanced through use of pictures and objects which pupils studied for differences and similarities. They discussed their observations with the special teacher individually.

At the end of the year the same tests were re-administered which were used for admissions. The differences in test scores obtained before and after training were studied with respect to the differences which could be expected in normal growth for each pupil. Normal growth was determined by charts in standardized manuals such as WISC. Averages, made on 172 pairs of scores, indicate that the growth, in excess of the expected, for the Goodenough Draw-A-Man was 5 months, for reading improvement 1.8 months, for Bender gestalt 6.7, for geometric shapes 8.6, for WISC similarities 10 and for block design 12 months. This indicates growth rate in all six areas well beyond the expected. Another study of modal groupings showed that from fifty to seventy-five per cent of all of the pupils fell into this category of progressing beyond normal growth rate. In March, 1968, 100 pupils who had been trained last year, but not this year, were re-tested for retention of skills learned. No regression of skills was noted, indicating a lasting effect of training.

Improvement in academic work as well as increased attention span was also reported by teachers for about 80% of the pupils in training. It appears that perceptual training is an asset to some underachievers in elementary school.

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Table 6

Number of Boys and Girls Participating
1966 - 1967

	Grade	Boys	Girls	Totals
Draper	1	6	10	16
	2	8	1	9
	3	8	4	12
	4	1	1	2
	5	1	0	1
		24	16	40
Berne	1	12	3	15
	2	10	6	16
	3	3	2	5
	4	2	0	2
	5	2	1	3
	Special Class	1	0	1
		30	12	42
Duanesburg	1	10	11	21
	2	5	5	10
	3	6	0	6
	4	3	0	3
		24	16	40

1967 - 1968

Draper	kdg	2	0	2
	1	9	8	17
	2	2	4	6
	4	1	0	1
		14	12	26
Duanesburg	1	10	7	17
	2	5	6	11
	5	1	0	1
		16	13	29